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Ceballos Lab Aims to Increase Efficiency of Biofuel Production

Summary: Ceballos received a National Science Foundation grant for his project "Commercialization of enzyme platforms for biofuel production."

(September 20, 2013)-Michael Ceballos, assistant professor of biology, has received a National Science Foundation (NSF) Innovation Corps Team Program (I-Corps Teams) grant for his project "Commercialization of enzyme platforms for biofuel production." The aim is to consider the potential of commercializing technology under development in the Ceballos Lab.

According to Ceballos, a major bottleneck in bioethanol production processes is the inefficient deconstruction of lignocellulosic substrates from feedstock. Since pretreatments used to prime feedstock reduce enzymatic efficiency, additional production steps must be taken to ensure the enzymes are optimally active. The development of technologies that enhance the efficiency of enzyme-mediated processes in feedstock breakdown is key to reducing costs in corn-based ethanol production and in future markets such as cellulosic ethanol, which could make bioethanol an economically competitive alternative to fossil fuel.

Ceballos's work emerged as a spin-off from a prototype developed in the labs of Jonathan Trent and Chad Paavola at NASA Ames Research Center, where he served as a pre-doctoral intern in 2008. Under a NSF Early Concept Grants for Exploratory Research (EaGER) award, he developed a mobile enzyme sequestration platform (mESP) system, which allows for enhanced substrate degradation under harsh conditions. With Mike O'Brien, the project's entrepreneurial lead, Mick Miller, president of Energetix, LLC, Warren Anderson, chairman of the Board of Directors, DENCO II, Inc., and Natalia Batchenkova, a student researcher, Ceballos seeks to expand this technology from a laboratory model to an industrial-scale system, transfer the current technology to the commercial sector, and accelerate the development of new mESP prototypes for lignocellulosic production processes-.

"Right now we are looking into upscaling the lab model to see if the process is viable on a larger scale," says Ceballos. "We are fortunate to have a local industrial partnership with Energetix and DENCO II, which will allow us to test the technology in a fully functional bioethanol production facility."

Ceballos believes the commercialization of the mESP system will provide opportunities for local, regional, and national producers to enhance corn-based production of biofuels while opening up the lignocellulosic-based biofuels market. The project could result in higher demand for local products and increased employment opportunities in the area as well. For these reasons and others, Ceballos sees the project as a means of fostering a natural partnership between the campus and local community.

"We're trying to do our part to forward the green energy agenda embraced by the University as well as the desire for collaboration and exchange with community business interests."

I-Corps Teams is a public-private partnership program that teaches grantees to identify valuable product opportunities

that can emerge from academic research and offers entrepreneurship training to student participants. Additional information is available online.

Pictured above: Lowell Rasmussen, vice chancellor for finance and facilities, Mick Miller, president of Energetix, LLC, Warren Anderson, chairman of the Board of Directors, DENCO II, Inc., Mike O'Brien, entrepreneurial lead, Natalia Batchenkova, student researcher, and Michael Ceballos, principal investigator.